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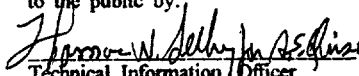
SANITIZED VERSION OF BI-WEEKLY PROGRESS REPORT
FOR WEEK ENDING JULY 19, 1946
(Sanitized Version of CRD Document # KZ-239)

Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

September 12, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
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Oak Ridge K-25 Site

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PROCESS ANALYSIS SECTION

BI-WEEKLY PROGRESS REPORT ENDING JULY 29, 1966

W. A. Garrett

I. Separation Performance StudiesA. Output from Plants of Reduced Size

If the combined plants (K-25 plus K-27) are shortened by removal of section 306, the maximum output will be reduced by an amount varying from 1% to 2.4% at product purities of 43200% and 44800% respectively. Removal of sections 306, 305 and 304 causes a 10% to 25% loss in output depending upon the desired top product concentration (at purities ranging from 43240% to 44300%). When the K-27 plant is operated as an independent cascade, the maximum output of 432400% material is 28% of that which can be attained from operation of the combined plants.

B. Installation of New Barrier in Section 302

If 90 stages tubed with a new type of barrier are installed in buildings 3 and 4 of section 302, a 1.4% increase in output of 412000% X material could be attained. (Calculations are based on the assumption that the new barrier material has properties equivalent to those of the K-27 barrier.) The new barrier should be operated at a pressure, _____ for 412000% product concentration.

Classification changed for: _____
(level and category)

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C. Effect of Increasing Frequency in 304 Section to 65 Cycles

An increase in product purity of 0.09% can be attained by operating section 304 at 65 cycles when producing material of approximately 46000% X. The additional output attained by the frequency change is accompanied by an increased power consumption of 1.3 megawatts.

II. Engineering Data

A. Technical Data Book

A section on Variation Equations has been prepared in rough form. Included are equations which may be used to predict the percentage change in product purity when the steady state operation of the plant is upset for a prolonged period by

- (1) Changing the number of active stages,
- (2) Changing the interstage flow rate,
- (3) Changing the psi value,
- (4) Plugging of a stage

The section on stage equations has been completed and is ready for limited distribution.

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PROCESS DEVELOPMENT SECTION

BI-WEEKLY PROGRESS REPORT ENDING JULY 19, 1946

W. C. Moore

Compiled by: R. B. Korsmeyer

I. Chemical Development

A. Recovery of C-2144 and MFL

During the past two weeks 3200 pounds of MFL were recovered.

The Oliver rotary filter press has been assembled and has been operating satisfactorily. The filter has been successfully used to extract the oil from 190 pounds of C-2144 filter cake and from 18 pounds of Class "B" MFL filter cake.

The original filter cake from all Class "B", "C", and "D" contaminated MFL has been processed for removal of oil and dried, and together with the C-2144 dry cake is ready for treatment to recover the "T" present.

B. Freon Recovery

A total of 287 pounds of pump flushings were treated during this period with a yield of 227 pounds of Freon and approximately 15 to 25 pounds of MFL. Efficiency of Freon recovery was 87%.

C. Recovery of "T" From Carbon

The furnace in K-1303 was operated from 6:00 P.M. of 7/16 until 2:00 P.M. of 7/18. Approximately 200 pounds of contaminated carbon, with 43.5% "T", was burned in the above period of time. A weight balance, which will indicate the efficiency of the burning operation, is pending; samples of the furnace ash have been sent to the laboratory for analysis.

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Certain changes in the furnace are being made to eliminate the presence of HF fumes and to facilitate charging and ash removal.

A 3/4 inch deep bed of carbon was burned in the muffle furnace for 7 hours at a furnace temperature of 900°F. with a flow of air through the furnace. According to the lab analysis 72.2% "F" and 0.47% "C" was found in the residue. A material balance showed that a recovery of 99% was obtained.

An analysis of the residue of the 1-inch bed of contaminated carbon which was burned at 1100°F. with a rapid flow of air over the top of the bed (see Bi-weekly Progress Report for Period Ending 7/5/46) indicated a recovery equally as good as that reported above.

The analysis of the residue of the 1½ inch bed which was burned in a monel tray at 1100°F. for 16 hours with a moderate air flow through the furnace (also see above mentioned Progress Report) indicated an unsatisfactory recovery however, (52.6% "F", 28.2% "C"). This poor recovery was probably due to insufficient air and/or improper tray design.

D. Reaction of C-216 and Carbon

In a fourth experiment, 0.15 lbs. of C-216 was passed through a bed of carbon heated to 400-500°F. The carbon was then purged with 20 cu. ft. of nitrogen after which the temperature was raised rapidly by the external heater. No noticeable reaction occurred even though the temperature reached 775°F. The bed was then cooled by passing through 95 cu. ft. of N₂. The external heater

was then turned up and some C-216 admitted. At about 625°F. carbon dust poured from the reactor although not as great an amount as in the previous experiments.

E. Dew Point Trace Indicators

1. The color standards for the silica gel indicators are being improved in the range - 60 to - 80° F. One standard @ 70°F. has been completed.
2. Silica gel indicators were installed on the cell ambients on nine cells in the 306 section to test their operation. On the basis of two weeks run the test was considered successful. Practically all data taken by operations showed the silica gel indicators to check the platinum plate method to better than 5°F.
3. Silica gel indicators were installed,

The dew point in these rooms is in the range + 20 to + 30°F., therefore this type indicator can measure the dew point accurately only if the time required to change "dry" silica gel to "wet" gel is measured.

F. Recovery of 616 from 616/816 Mixture

895 pounds of 616/816 mixture were run through the recovery plant (sections 131 and 132). Since it was not possible to use the filter press of the 131 section efficiently (200 mesh screens would not hold the solid uranate), the slurry of Na_2UO_4 in KOH was drained into 55-gallon drums and is being processed through an Oliver filter press.

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G. P-10 Plastics

1. Ten sheets (6" x 10" x 0.1") of MFP/TF₄ mixture were made during this period, and seven of these sheets have been transferred to the Special Hazards Group. Forty grams of 50% MFP - 50% TF₄ mixture were also sheeted and then micro-pulverized for the experimental work pertaining to the recovery of "T" from MFP by leaching.
2. 225 grams of MFP were molded into 48 pieces 1" x 1" x 1/16" for fabrication into Chapman Coolant Valve seats.
3. A cost analysis of the fabrication of 1000 valve seats for K-25 was made, and the approximate cost was found to be \$635. This figure includes the cost of machining as well as the cost of fabrication.

H. Conversion of Cobalt Difluoride to Cobalt Trifluoride

Approximately 2 pounds of cobalt difluoride were successfully converted to the trifluoride in conjunction with the development of a suitable method of regenerating the conditioning agent (cobalt trifluoride) for C-2144 and MFL. The cobalt difluoride was placed in the C-216 reactors of building K-1301, and C-216 added for 9 hours under atmospheric pressure conditions. The temperature rose slowly to 200°F. and remained at that value during most of the reaction time. It is estimated that this 9 hours reaction time is about three times as long as is necessary.

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II. Viscosity Plate Seals

The results of the Daily Seal Inspection Reports, #64 to 67 inclusive are tabulated below.

<u>Type Seal</u>	<u>Number Inspected</u>	<u>Failed Parts Not Evident</u>	<u>Melted Solder</u>	<u>Heavy Wear and Corrosion</u>
H-1	5	0	0	5
H-2	2	0	0	2
H-4	<u>37</u>	6	14	17

Total 44

It is to be noted that there have been no seal replacements in 306 from the 22nd of last month to date.

The average seal plate temperature of the six L-7 type seals installed in cell 5 of 306-7 on 11/24/45 has not changed significantly, indicating the condition of those seals to be good after 8 months of operation.

III. Converters and Conditioning

A. The Mobile Cold Trap

The mobile cold trap was conditioned and is now available for use or storage.

B. Psi Tests

Four psi tests were completed during this period. These tests were conducted in K-402-7 at tails pressure, and in K-304-4 at tails pressure.

C. Maximum Operating Temperatures for P-10 Valve Seats

Another run has been made to determine the maximum safe operating

temperature for P-10 valve seats. This test consisted of holding the temperature of the system at 300°F for 4 hours with C-216 in contact with the valve seats. One valve was closed and the other open during the tests. The seats appeared to be in good condition after the test.

IV. Mechanical Development

A. Valley Iron Pumps

1. MFI Impregnated Amorphous Carbon Seals

These seals have continued to operate satisfactorily. The total running time is now:

G-72	93 hours	30 minutes
60 - 70% C-616	<u>1,394</u>	<u>20</u> "
Total	1,987	50 "

The leak rate has decreased slightly, and is now 0.189 std. cu. ft./hr. at 0.5 psi seal feed differential pressure.

The test on these seals is considered complete and, as far as can be determined from a single test, they are satisfactory sealing rings for C-616 service within a limited temperature range.

2. MFI P-10 Impregnated Graphite Seals

The graphite seals impregnated with a high melting fluorowax have continued to operate satisfactorily. The running time is now:

G-74	79 hours	20 minutes
60 - 70% C-616	<u>345</u>	<u>55</u> "
Total	425 hours	15 minutes

The present leak rate is 0.037 std. cu. ft./hr. at 0.5 psi seal feed differential pressure.

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B. Beach-Russ Pump Sludging Test

A performance test was run on the special pump prepared for Cascade Services by the Vacuum Pump Shop. Using C-74 as the test gas, the suction pressure was varied from blank-off to 4 psia. The test shows the pump to be approximately as efficient as the Beach-Russ pumps tested at the Kellogg Labs. but slightly below the efficiency of the average production models.

A sludging test is now in progress.

C. Pilot Plant Orifices

Eighteen orifices were calibrated for use in the Pilot Plant, however two were discarded due to large variations in discharge coefficient with Reynolds number.

Four more orifices are needed to complete the Pilot Plant order.

D. K-312

Two 90-mesh, large area experimental screens have been installed in the lazy-jack lubrication systems of K-312-2.22. For test purposes, the Purolator screens have been by-passed. The performance of these experimental screens is to be used as a criterion for further installations.

E. Lubrication

Navy Symbol Oil 2075 used in the building circulating systems has the broad specification of 70-90 seconds at 130°F. Texas Oil Company has been supplying this material at 88 seconds and we have approved their recent tank car of 83 second oil.

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Used oil samples from the basement Westinghouse fan motors were sent to Socony Oil Company for their comments. It is our opinion, however, that since the oil change period for these motors has been raised from two weeks to four months by use of the best of eight test oils, that little more can be expected of any other oil that might be tried with the present lead type babbit bearing material.

V. Line Recorder

A. Oxygen Losses in the Cascade

The test to determine the amount of oxygen lost in the cascade was carried out over a forty hour period from July 3 to July 5. The total oxygen loss was determined to be 2 ± 0.5 scf/day. Argon and oxygen analyses of the purge gases show definitely that the ratio of oxygen to argon in the purge gas is less than that in the air leaking into the cascade.

B. C-816 "B" Values

A report has been prepared presenting the considerations for a test to determine the C-816 "B" values in a cell containing an barrier. A design is presented for a factorial experiment (i.e., a plan for the collection of data in which all variables concerned are varied for each run) and a cost estimate for the work is included.

C. C-816 Inventory in the Cascade

During the past two weeks the 816 inleakage to the cascade was less than 0.5 lbs/day. The present inventory of 816 is 115 ± 10 lbs.

The fact that the inventory two weeks ago was 10 pounds higher may be explained by the fact that at that time the 816 inventory was not at equilibrium.

D. Product Cylinders

At the request of A. P. Huber a study was made of a new method of product withdrawal whereby a maximum of 700 grams of product was to be permitted in each cylinder. A test manifold to collect a fixed volume of gas was built and installed in 306-7. The first test made on PG containing 14% G-74 proved unsuccessful, since the high inerts concentration prevented rapid transfer of 616. No further tests were made since another method had proved successful.

Tests were also conducted to determine the feasibility of inserting a plug in the product cylinder to limit the weight of product to 700 grams. By cooling the cylinder on L-28 for one hour it was found that the weight of product could be controlled at 630 ± 30 grams. This method was considered satisfactory and will be employed when product is withdrawn in the future.

E. Calibration of Fission Counting Assay Machine

The fission counting assay machine located in 402-1 has had a new manifold installed. Calibration was completed on July 12 and the instrument has been operating continuously since that time. An agreement has been reached with Operations that analyses every hour with a precision of 2% will be satisfactory. To date the precision has fluctuated from 0.1 to 5.8%, but it is felt

that this fluctuation can be eliminated and that a normal precision of 1.5% should be attainable. A graph is being prepared for the benefit of the operators which should eliminate the majority of the assay calculations.

VI. Process Tests and Special Problems

A. Instrumentation in K-631 Surge System

This investigation has been completed and a report has been prepared recommending that two 0 - 2 psia PBM's be installed in conjunction with the present 0 - 5 psia instrumentation. The 0 - 2 psia transmitters would have a guaranteed accuracy of ± 0.01 psia as compared to ± 0.025 psia for the present transmitters. The mean pressure could then be used to determine the inventory of the surge system since this pressure represents the equilibrium pressure ± 0.01 psia for the greater volume of the system. Although a pressure differential greater than 0.01 psi exists between the mean pressure and the supply header pressure, the volume of this header is so small in comparison with the total volume that the differential can be neglected for the inventory calculations.

B. Time Required to Freeze Product Cylinders

Tests were conducted to determine the time required to cool C-616 in product cylinders from room temperature to a temperature where the top flange could be removed without creating a safety hazard or significant loss of C-616 vapors. Immersion of a silver product cylinder containing 1072 grams of C-616 for 30 minutes

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in dry ice trichloroethylene slush or 10 minutes in L-28 is sufficient. The cylinder can be handled safely for about ten minutes after being removed from the freezing bath.

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PROGRESS DESIGN SECTION

BI-WEEKLY PROGRESS REPORT ENDING JULY 19, 1946

A. A. Abbatiello

I. Product Cylinder

Corrosion of the aluminum alloy valve stem of the valve-in-flange product cylinder has made a slight redesign necessary. The threads will be protected in the future either by a cap screwed against a gasket or by coating the threads with some sealing material.

II. Flexible Hose for L-28 Buggies

The flexible hose on the L-28 buggy has frequently developed leaks at each end, necessitating cutting off of the leaking portions and reconnecting to the adapters. A bell-shaped guard has been designed which will prevent any bending of the hose in the first few convolutions and will restrain the hose from sharp bends.

III. Gas Bearing Blower Loop

Several minor revisions have been made in the design of the gas bearing blower loop. These have included moving the cooling systems outside the enclosure and changes to the supporting structure to facilitate working around the blower.

REPORTS DISTRIBUTED FOR THE PERIOD ENDING JULY 19, 1946

<u>Title</u>	<u>Author</u>	<u>Date</u>
Precision of Flows as Calculated from the Fisher and Republic Flow Control Valves	J. P. Kelly	July 11, 1946
Effect of Increasing Frequency to 65 Cycles in 304 Section	W. G. Siedenbunrg	July 15, 1946
Installation of New Barrier in Section 302 (Addendum to Report 2.3.1)	J. H. Barnes	July 16, 1946
Quality Control Study of Mass Spectrometer Data	W. H. Detlefs	July 16, 1946
Transient Losses Due to Mixing Inventories	W. G. Siedenbunrg	July 15, 1946
Stage Properties for the K-306 Section Operating at Variable Frequencies with Pure C-616	S. A. Levin	July 18, 1946
Anticipated Output from Plants of Reduced Size	E. Johanson P. Wood	July 16, 1946
Review of Surface Consumption in Plant	C. P. Coughlen D. Stewart	July 11, 1946
Procedure for Determining Optimum Time for Removing Moisture from Converters	J. A. Martin	July 11, 1946
Forced Ventilation of K-27 Stage Pump Motors	R. C. Olson A. A. Abbatiello	July 5, 1946

DISTRIBUTION

1. K-25 Site Records (RC)
2. ChemRisk/Shonka Research Associates
3. DOE Public Reading Room
4. S. G. Thornton (K-25 EMD)